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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/771,092	01/26/2001	William D. Fisher	10003512-1	7692

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AGILENT TECHNOLOGIES  
Legal Department, 51U-PD  
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EXAMINER

GORDON, BRIAN R

ART UNIT	PAPER NUMBER
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1743

DATE MAILED: 03/27/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

09/771,092

Applicant(s)

FISHER, WILLIAM D.

Examiner

Brian R. Gordon

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 26 January 2001.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-26 is/are pending in the application.
- 4a) Of the above claim(s) 15-26 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-14 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☒ Claim(s) 1-26 are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 26 January 2001 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on \_\_\_\_\_ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

**Priority under 35 U.S.C. §§ 119 and 120**

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

**Attachment(s)**

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☒ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 2.
- 4) ☐ Interview Summary (PTO-413) Paper No(s) \_\_\_\_\_.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_.

## DETAILED ACTION

### *Election/Restrictions*

1. Restriction to one of the following inventions is required under 35 U.S.C. 121:
  - I. Claims 1-14, drawn to a method of dispensing drops from a pulse jet, classified in class 436, subclass 180.
  - II. Claims 15-26, drawn to a drop deposition apparatus, classified in class 347, subclass 68.

The inventions are distinct, each from the other because of the following reasons:

2. Inventions I and II are related as process and apparatus for its practice. The inventions are distinct if it can be shown that either: (1) the process as claimed can be practiced by another materially different apparatus or by hand, or (2) the apparatus as claimed can be used to practice another and materially different process. (MPEP § 806.05(e)). In this case the method or process may be practiced by hand the process does not require the use of a striker. One may hit the pulse jet with his/her hand or with or onto any other object in order to discharge the drops.
3. Because these inventions are distinct for the reasons given above and have acquired a separate status in the art as shown by their different classification, restriction for examination purposes as indicated is proper.
4. Because these inventions are distinct for the reasons given above and the search required for Group I is not required for Group II, restriction for examination purposes as indicated is proper.

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5. Because these inventions are distinct for the reasons given above and have acquired a separate status in the art because of their recognized divergent subject matter, restriction for examination purposes as indicated is proper.

6. During a telephone conversation with Gordon Stewart on February 27, 2003 a provisional election was made with traverse to prosecute the invention of Group I, claims 1-14. Affirmation of this election must be made by applicant in replying to this Office action. Claims 15-26 are withdrawn from further consideration by the examiner, 37 CFR 1.142(b), as being drawn to a non-elected invention.

***Claim Rejections - 35 USC § 102***

7. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

8. Claims 1-4, 10, and 11-12 are rejected under 35 U.S.C. 102(b) as being anticipated by Kutami et al. US 6,132,035.

Kutami et al. disclose a method of employing an ink jet printing head includes a pressure chamber supplied with ink, a vibration plate, a nozzle, a force applying mechanism and a resilient member. The vibration plate is coupled to the pressure chamber and is subject to being driven in vibration to increase pressure in the pressure chamber when force is applied to the vibration plate. The nozzle communicates with the pressure chamber, and ink is ejected through the nozzle when pressure in the pressure chamber is increased. The force applying mechanism applies force to the vibration plate

to drive the vibration plate in vibration and thereby increase the pressure in the pressure chamber to eject ink from the nozzle.

A wire magnetic type drive of the normal wire dot printing head, a stacked type piezoelectric element, or a piezoelectric element having a displacement enlarging mechanism may be used as the driving part.

According to the sixth embodiment and its modification, it is possible to sufficiently displace the outer wall 11a even when the pressure of the driving part 15 is small. Hence, the voltage applied to the driving part 15 can be small. Therefore, the power consumption can be reduced, and the reliability is ensured even when the size of the printing head is reduced. Moreover, the running cost is reduced.

According to the structure in which a shock is applied to the outer wall (vibration plate) 11a by the projection of the displacement transmitting part (wire) 14 (striker) so as to eject the particles 17a of the ink 17 from the nozzle 13 (opening of chamber), a tip end 14a of the wire 14 may fluctuate as indicated by a dotted line in FIG. 23 when it hits (strikes) the vibration plate 11a. In this case, the shock applied to the vibration plate 11a may weaken it, and shock may be applied to the vibration plate 11a two times. For this reason, the quantity, i.e., volume, and velocity of each of the ejected particles 17a of the ink 17 may decrease, and there is a possibility that the printing quality will deteriorate due to the double ejection.

In FIG. 25, the ink cassette 21 is made up of the ink tank 43, which stores the ink 17, and the plurality of pressure chambers 25 (25-1 through 25-N) which supply the ink 17 from the ink tank 43. This ink cassette 21 is fixed on a carriage 71 by a support 73.

In addition, the pressure applying mechanism 20 which is provided with a driving part 31 for driving and selectively projecting the plurality of wires 23 (23-1 through 23-N) is also fixed on the carriage 71.

The nozzles 24 (24-1 through 24-N) are formed in the respective pressure chambers 25, and the particles 17a of the ink are ejected in a direction shown by arrow B from a predetermined nozzle 24 by projecting the wire 23 to push the corresponding pressure chamber 24. A predetermined printing is made on a recording paper 72 by ejecting the particles 17a of the ink 17 in the direction shown by arrow B from the predetermined nozzle 24 and moving the pressure applying mechanism 20 and the ink cassette 21 by feeding the carriage 71. The nozzle 24 is provided on one end of the pressure chamber 25 and the vibration plate 25a is provided on the other end. Thus, the tip end part 23A of the wire 23 hits the vibration plate 25a when the wire projects in a direction shown by arrow A, and the particles 17a of the ink 17 are ejected in the direction shown by arrow B from the nozzle 24.

***Claim Rejections - 35 USC § 103***

9. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

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10. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

11. Claims 5-8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kutami et al. US 6,132,035.

Kutami et al. does not specifically recite a particular strike rate or the amount of energy delivered by each strike.

However, as to the strike rate and the amount of energy delivered to the chamber, Kutami et al. discloses that the pulse voltage V or the pulse width T of the driving signal S, which is supplied from a driving circuit 95 to the driving mechanism 20, is set to a predetermined value V1 or T1 by an instruction from a gradation instructing part 96. The driving mechanism 20 is driven by a predetermined driving signal S, so that predetermined ink particles 17a are ejected from the nozzle part 21. The voltage may be varied as desired to supply the appropriate strike rate and pulse rate.

It would have been obvious to one of ordinary skill in the art at the time of the invention to recognize that the strike rate and work of the striker (wire) may be varied to perform at the limits given by the claims.

12. Claims 9 and 13-14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kutami et al. as applied to claims 1-4, 10, and 11-12 above, and further in view of Wiktor US 9,232,129.

Kutami et al. does not disclose that the device comprises a thermoelectric ejector and that the device is employed for arraying DNA.

Wiktor discloses a piezoelectric actuated device for acquiring and dispensing fluid samples. Further more Wiktor recites that Hayes U.S. Pat. No. 5,622,897 describes a process of manufacturing a drop-on-demand ink-jet print head having n-type and p-type thermoelectric carriers.

Furthermore Wiktor discloses that instruments using pins for fluid transfer are used by Synteni, among other companies, to generate DNA arrays and are commercially available, for example, from BioRobotics and GeneMachines. Using pins is a simple, robust and practical means for fluid transfer but it suffers from some limitations. First of all it is slow. The pins have to stop at each spot and then wait for over a second for capillary action to transfer the fluid onto the substrate. By contrast, the piezoelectric based dispensing of the present invention is almost a thousand times faster. Pin based fluid transfer is sensitive to the wetting properties of the substrate. Also it can damage some substrates like Nylon membranes for example. These are not concerns for the piezoelectric dispensing which is non-contact. Pins generate relatively low density, poor quality arrays with approximately 50% variability in spot size. By contrast, piezoelectric dispensers generate arrays with almost an order of magnitude higher density and better than 3% spot size variability. Finally, pins are limited to



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acquiring and dispensing a fixed volume of fluid. Piezoelectric dispensers have thousands of times higher dynamic range. Sub nanoliter to tens of microliter volumes can be aspirated and subsequently dispensed in volumes ranging from 100 picoliters to several microliters per second.

It would have been obvious to one of ordinary skill in the art to recognize that the device of Kutami et al. may be modified to include a thermoelectric or piezoelectric ejector in order to overcome the disadvantages using a pin assembly for arraying DNA samples.

### ***Conclusion***

13. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Tseung et al., Ingehoven et al., Yang et al., Shalon et al., Sasaki, Kim et al., Oeftering, Feygin, Kutami et al. (,643), Clark et al., Columbus, Hayes et al., and Behrens et al. disclose fluid and ink dispensing methods and devices.


Any inquiry concerning this communication or earlier communications from the examiner should be directed to Brian R. Gordon whose telephone number is (703) 305-0399. The examiner can normally be reached on M-F, with 2nd and 4th F off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jill Warden can be reached on 703-308-4037. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 872-9310 for regular communications and (703) 872-9311 for After Final communications.

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Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0661.

brg  
March 24, 2003

  
Jill Warden  
Supervisory Patent Examiner  
Technology Center 1700